Physics
Wahr
copy 1

VOLUME 57 SECOND SERIES

CONTENTS

JANUARY 1, 1940

Floyd Karker Richtmyer 1
Instability of the Meson . . . . . MARTIN A. POMERANTZ 3
Gamma-Rays from Beryllium and Nitrogen Bombarded with Deuterons . . . . . H. R. CRANE, J. HALPERN AND N. L. OLESON 13
Zeeman Effects in Complex Spectra at Fields up to 100,000 Gauss . . . . . GEORGE R. HARRISON AND FRANCIS BITTER 15
Internuclear Distances in Se_2, Te_2, and HgCl by Electron Diffraction . . . . . LOUIS R. MAXWELL AND V. M. MOSLEY 21
Multiple Scattering of Electrons . . . . . S. GOUDSMIT AND J. L. SAUNDERSON 24
Concentration of Carbon 13 by Thermal Diffusion . . . . . ALFRED O. NIER 30
Concentration of Isotopes by Thermal Diffusion: Rate of Approach to Equilibrium . J. BARDEEN 35
Conductivity and Mobility of Thin Lead Films . . . . . M. G. FOSTER 42
Examination of Colored Alkali Halides for Photoelectric Hall Effect . . . . . JULIAN EVANS 47
Elastic, Dielectric and Piezoelectric Constants of Heavy-Water Rochelle Salt . . . . . A. N. HOLDEN AND W. P. MASON 54
On After-Effects in Solid Dielectrics . . . . . B. GROSS 57

Letters to the Editor:

Contributions to the Shear Constants of Hexagonal Crystals . . . . . H. B. HUNTINGTON 60
Simultaneous Penetrating Particles in the Cosmic Radiation . . . . . G. WATAGHIN, M. D. DE SOUZA SANTOS AND P. A. POMPEIA 61
New Proof of the Instability of the Mesotron . . . . . GIUSEPPE COCCONI 61
Multiple Scattering of Charged Particles . . . . . ARTHUR E. RUARK 62
Laboratory Study of Spark Discharge Between Conducting Clouds . L. B. SNODDY AND J. W. BEAMS 63

Proceedings of the American Physical Society:

New England Section: Dartmouth College Meeting, October 14, 1939 64
New York State Section: Rensselaer Polytechnic Institute Meeting, October 21, 1939 64
Chicago, Illinois Meeting, December 1–2, 1939: Minutes and Abstracts 1–38 65

JANUARY 15, 1940

Production of Soft Secondaries by Mesotrons . . . . . J. R. OPPENHEIMER, H. SNYDER AND R. SERBER 75
Proton-Deuteron Transformation as a Source of Energy in Dense Stars . W. A. WILDHACK 81
Relation Between Actual and Virtual Ionospheric Height . H. G. BOOKER AND S. L. SEATON 87
Reception of Radio Echoes From Distant Ionospheric Irregularities . . . . . J. A. PIERCE AND H. R. MIMNO 95
Nuclear Isomerism in Selenium and Krypton . . . . . ALEXANDER LANGSDORF, JR. AND EMILIO SEGRÈ 105
Quantitative Determination of the Neutron Moment in Absolute Nuclear Magnetons . . . . . LUIS W. ALVAREZ AND F. BLOCH 111
Contact Difference of Potential Between Barium and Zinc. The External Work Function of Zinc . . . . . PAUL A. ANDERSON 122
Water Vapor Molecule . . . . . BYRON T. DARLING AND DAVID M. DENNISON 128
Magnesium-Like Spectra of Chlorine, Potassium, Calcium and Scandium . . . . . W. L. PARKER AND L. W. PHILLIPS 140
Magnetic Energy Constants of Dipolar Lattices . . . . . J. A. SAUER 142
General Relativity and Flat Space. I . . . . . N. ROSEN 147
General Relativity and Flat Space. II . . . . . N. ROSEN 150
Note on Ether-Drift Experiments . . . . . N. ROSEN 154

Letters to the Editor:

Propagation of Electron Waves in Ionic Single Crystals . . . A. VON HIPPEL AND J. W. DAVISSON 156
Nonexistence of Transuranic Elements . . . . . LOUIS A. TURNER 157
Measurement of Mesotron Lifetime . . . . . W. M. NIELSEN, C. M. RYERSON, L. W. NORDHEIM AND K. Z. MORGAN 158

Alpha-Particle Groups from the Disintegration of Beryllium by Deuterons . . . . . SAMUEL K. ALLISON, ELIZABETH R. GRAVES AND LESTER S. SKAGGS 158
Internal Conversion in 6.4-Hour Cd . . . . . R. G. SACHS 159
On the Neutron's Magnetic Moment . . . . . O. HALPERN AND M. H. JOHNSON 160
On the Magnetic Moments of Light Nuclei . . . . . M. PHILLIPS 160
Neutron-Deuteron Scattering Cross Section . . . . . LLOYD MOTZ AND JULIAN SCHWINGER 161
Absorption Spectrum of Single-Crystal ZnS Phosphors . . . . . CHARLES J. BRASEFIELD 162

FEBRUARY 1, 1940

Radioactive Isotopes of Scandium and Their Properties . . . . . HAROLD WALKE 163
K-Electron Capture and Internal Conversion in Cr^{51} . . . . . H. WALKE, F. C. THOMPSON AND J. HOLT 171
Radioactive Isotopes of Calcium and Their Suitability as Indicators in Biological Investigations . . . . . H. WALKE, F. C. THOMPSON AND J. HOLT 177
Acceleration of Electrons in a Crystal Lattice . . . . . W. V. HOUSTON 184
Gamma-Rays from Aluminum Due to Proton Bombardment . . . . . G. J. PLAIN, R. G. HERB, C. M. HUDSON AND R. E. WARREN 187
Note on Nuclear Isomerism . . . . . R. G. SACHS 194
Tests for the Validity of the X-Ray Crystal Method for Determining *N* and *e* with Aluminum, Silver and Quartz . . . . . P. H. MILLER, JR. AND J. W. M. DUMOND 198
Hyperfine Structure of the Quadrupole Line 2815A and of Some Other Lines of Ionized Mercury . . . . . S. MROZOWSKI 207
Positive Column of the Nitrogen Arc at Atmospheric Pressure. II. . . . . ALBERT M. STONE AND EDWARD S. LAMAR 212
Absorption of Supersonic Waves in Water and in Aqueous Suspensions . . . . . G. K. HARTMANN AND ALFRED B. FOCKE 221
Computation of Quadrupole and Magnetic-Dipole Transition Probabilities . . . . . GEORGE H. SHORTLEY 225
Absolute Measurements in the Pressure Range up to 30,000 kg/cm² . . . P. W. BRIDGMAN 235
Compressions to 50,000 kg/cm² . . . . . P. W. BRIDGMAN 237

Letters to the Editor:

Outer, Initial Permeability of Nickel from 10 to 70 Megacycles . . . . . J. BARTON HOAG AND J. L. GLATHART 240
Erratum: The Radioactivity of Mn^{56} . R. H. BACON, E. N. GRISEWOOD AND C. W. VAN DER MERWE 240
Use of Radioactive Isotopes of the Common Elements in Physiology . . . . . G. HEVESY 240
Energy and Half-Life of Be^{10} . . . . . ERNEST POLLARD 241
On Bose-Einstein Fluids . . . . . LOUIS GOLDSTEIN 241
Thermal Separation Ratios Calculated from Viscosity Data . . . . . HARRISON BROWN 242
New Energy Levels in the Silver Atom . . . . . EBBE RASMUSSEN 243
New Vacuum Tube Scaling Circuits of Arbitrary Integral or Fractional Scaling Ratio . . . . . HAROLD LIFSCHUTZ 243
Energy Levels, Mass and Radioactivity of A^{41} . . . . . WILLIAM L. DAVIDSON, JR. 244
Contributions of Showers to the Coincidences Recorded at High Elevations . . . . . THOMAS H. JOHNSON AND J. GRIFFITHS BARRY 245
Ferromagnetic Anisotropy in Body-Centered Cubic Iron-Nickel Alloys . . . . . L. W. MCKEEHAN 246
Proton-Proton and Proton-Neutron Interactions for the Morse Potential . . . . . HUBERT M. THAXTON AND A. M. MONROE 246

Proceedings of the American Physical Society:

Berkeley, California, Meeting, December 22 and 23, 1939: Minutes and Abstracts 1–34; Author Index 247

FEBRUARY 15, 1940

Note on *p*-Wave Anomalies in Proton-Proton Scattering . . . . . G. BREIT, C. KITTEL AND H. M. THAXTON 255
Meson Theory of Nuclear Forces. I. General Theory . . . . . H. A. BETHE 260
Multiple Scattering of Fast Electrons . . . . . C. W. SHEPPARD AND W. A. FOWLER 273
Scattering and Polarization of Electrons . . . . . M. E. ROSE 280
Conditions Influencing the Intensity of the $^3\Pi - {}^1\Sigma$ Cameron Bands of CO . . . . . GEORGE E. HANSCHE 289

Normal Electron Configuration of Singly Ionized Gadolinium . . . . . W. E. Albertson, Hendrick Bruynes and Richard Hanau 292
Dielectric Constant of Water Vapor at a Frequency of 42 Megacycles . . Angus C. Tregidga 294
Thermionic Constants of Tungsten as a Function of Crystallographic Direction . . . . . M. H. Nichols 297
Stationary States of Scalar and Vector Fields . . . . . H. Snyder and J. Weinberg 307
On the Existence of Stationary States of the Mesotron Field . . . . . L. I. Schiff, H. Snyder and J. Weinberg 315
Generalized Theory of Diffusion . . . . . E. J. Hellund 319
Generalized Theory of Diffusion. II. . . . . E. J. Hellund 328

Letters to the Editor:

Secondary Neutrons from Uranium . . . . . Louis A. Turner 334
Simultaneous Penetrating Rays from the Atmosphere . . . . . Vernal Josephson, Darol K. Froman and J. C. Stearns 335
Positive Ion Emission from Nickel . . . . . G. A. Jarvis 335
Correlation Between Cosmic-Ray Intensity and Upper Air Pressures and Temperatures . . . . . Niel F. Beardsley 336
Structure and Ferromagnetism of Cold-Worked Copper Containing Iron . . Cyril Stanley Smith 337
Cloud-Chamber Photographs of Cosmic Rays up to an Altitude of 29,300 Feet . Gerhard Herzog 337
Coefficient of Thermal Diffusion of Neon and Its Variation with Temperature . . Alfred O. Nier 338
Nuclear Excitation of Lead by X-Rays . . . . . Bernard Waldman and George B. Collins 338
Simultaneous Penetrating Particles in the Cosmic Radiation. II . . . . . G. Wataghin, M. D. de Souza Santos and P. A. Pompeia 339
Nuclear Electron Showers . . . . . Alexander W. Stern 339
Positive Point-to-Plane Corona in Pure A, H_2 and N_2 . . . . . Gerhard L. Weissler 340
Bremsstrahlung of RaE . . . . . E. Stahel and J. Guillissen 341
New High Pressures Reached with Multiple Apparatus . . . . . P. W. Bridgman 342

Proceedings of the American Physical Society:

Columbus, Ohio, Meeting, December 28–30, 1939: Minutes and Abstracts 1–75; Author Index . . 344

March 1, 1940

Radioactive Isotopes of Tellurium . . G. T. Seaborg, J. J. Livingood and J. W. Kennedy 363
Production of Radium E and Radium F (Polonium) from Bismuth . . . . . J. M. Cork, J. Halpern and H. Tatel 371
Distribution in Energy of the Fragments from Uranium Fission . . . . . M. H. Kanner and H. H. Barschall 372
Determination of the Masses and Velocities of Three Radium B Beta-Particles. The Relativistic Mass of the Electron . . . . . Marguerite M. Rogers, A. W. McReynolds and F. T. Rogers, Jr. 379
Relativistic Magnetic Moment of a Charged Particle . . . . . Henry Margenau 383
Gamma-Radiation from Nitrogen Bombarded by Deuterons . . . . . E. R. Gaerttner and Louis A. Pardue 386
Meson Theory of Nuclear Forces. Part II. Theory of the Deuteron . . . . . H. A. Bethe 390
Electromagnetic Self-Energy of Mesotrons . . . . . R. D. Richtmyer 413
Variation of the Adiabatic and Isothermal Elastic Moduli and Coefficient of Thermal Expansion with Temperature through the λ-Point Transition in Ammonium Chloride . . . . . Andrew W. Lawson 417
Paramagnetic Relaxation Times for Titanium and Chrome Alum . . . . . J. H. Van Vleck 426
Variable Structures and Continuous Scattering of X-Rays from Layer Silicate Lattices . . . . . Sterling B. Hendricks 448
Excited States of the O^{16} Nucleus . . . . . David M. Dennison 454

Letters to the Editor:

Radioactive Standards . . . . . L. F. Curtiss, Clark Goodman, Alois F. Kovarik, S. C. Lind, C. S. Piggot and Robley D. Evans 457
On Bose-Einstein Fluids. A Correction . . . . . The Editor 457
Deviation from the Coulomb Law for a Proton . . . . . W. E. Lamb, Jr. 458
Possible Production of Radioactive Isotopes of Element 85 . . . . . D. R. Corson, K. R. MacKenzie and E. Segrè 459
Energy Losses of Fast Mesotrons and Electrons in Condensed Materials . . . . . Otto Halpern and Harvey Hall 459

MARCH 15, 1940

Variation of the Hard Component of Cosmic Rays with Height and the Disintegration of Mesotrons . . . . . BRUNO ROSSI, NORMAN HILBERRY AND J. BARTON HOAG 461
Electrons Arising from the Disintegration of Cosmic-Ray Mesotrons . . . . . BRUNO ROSSI 469
On the Yield of Nuclear Reactions with Heavy Elements . . . . . V. F. WEISSKOPF AND D. H. EWING 472
Ionization Loss of Energy in Gases and in Condensed Materials . . . . . ENRICO FERMI 485
On the Quantization of Mass . . . . . BORIS PODOLSKY AND HERMAN BRANSON 494
Halogen Molecule Spectra. II. Interval Relations and Relative Intensities in the Long Wave-Length Spectra . . . . . ROBERT S. MULLIKEN 500
Transformations of Matter-Radiation Gas Mixtures . . . . . ROBERT M. WHITMER 516
Magnetic Resonance for Nonrotating Fields . . . . . F. BLOCH AND A. SIEGERT 522
Optical and Magnetic Properties of a Magnetite Suspension . . . . . C. W. HEAPS 528
Dispersion of Supersonic Waves in Cylindrical Rods of Polycrystalline Silver, Nickel, and Magnesium . . . . . SIDNEY K. SHEAR AND ALFRED B. FOCKE 532
Variation of the Principal Elastic Moduli of Cu_3Au with Temperature . . . . SIDNEY SIEGEL 537

Letters to the Editor:

Nuclear Fission of Separated Uranium Isotopes . . . . . ALFRED O. NIER, E. T. BOOTH, J. R. DUNNING AND A. V. GROSSE 546
On the Calculation of the Thermal Diffusion Constant from Viscosity Data . . . . . R. CLARK JONES AND W. H. FURRY 547
Spontaneous Disintegration of the Neutral Mesotron (Neutretto) . . . . . SHOICHI SAKATA AND YASUTAKA TANIKAWA 548
On the Polarization of Electrons by Scattering . . . . . L. LANDAU 548
Radioactive Carbon of Long Half-Life . . . . . SAMUEL RUBEN AND MARTIN D. KAMEN 549
Correction to Measurements with the Electrostatic Analyzer . . . . . J. MATTAUCH 549
Correction to Electrostatic Analyzer Measurements . . . . . SAMUEL K. ALLISON, LESTER S. SKAGGS AND NICHOLAS M. SMITH, JR. 550
Transmission of Neutrons of Different Energies Through Quartz Crystals . . . . . MARTIN D. WHITAKER, WILLIAM C. BRIGHT AND EDGAR J. MURPHY 551
Erratum: Cosmic-Ray Particles of Great Depth . . . . . J. BARNÓTHY AND M. FORRÓ 552
Multiple Scattering of Electrons . . . . . S. GOUDSMIT AND J. L. SAUNDERSON 552
Some Fission Products of Uranium . . . . . E. SEGRÈ AND C. S. WU 552

Proceedings of the American Physical Society:

New England Section: Cambridge, Massachusetts, Meeting, January 26–27, 1940 553
New York, New York, Meeting, February 23–24, 1940: Minutes and Abstracts 1–75; Author Index . 553

APRIL 1, 1940

On the Interpretation of Neutron Measurements in Cosmic Radiation . . . . . H. A. BETHE, S. A. KORFF AND G. PLACZEK 573
Excitation of the 455-Kev Level of Li^7 by Proton Bombardment . . . . . C. M. HUDSON, R. G. HERB AND G. J. PLAIN 587
Positive Excess and Electron Component in the Cosmic-Ray Spectrum . DONALD J. HUGHES 592
Theoretical Study of the Diffuse Scattering of X-Rays by Crystals . . W. H. ZACHARIASEN 597
Intensity Distribution in X-Ray and Electron Diffraction Patterns. X-Ray Atom Factors of Zinc in Zinc Oxide and Chemical Binding . . . C. H. EHRHARDT AND K. LARK-HOROVITZ 603
Effect of Valence Electrons and Electron Cloud Distortion upon Intensities in Electron and X-Ray Scattering (Applied to Zinc Oxide) . . . . . VIVIAN A. JOHNSON 613
X-Ray Dispersion in Copper Crystals . . . . . E. M. MCNATT 621
Anode Effect as a Function of Temperature . . . . . PAUL L. COPELAND 625
High Frequency Behavior of a Space Charge Rotating in a Magnetic Field . . . . . JOHN P. BLEWETT AND SIMON RAMO 635
On the Problem of Degeneracy in Quantum Mechanics . . . J. M. JAUCH AND E. L. HILL 641

On the Connection Between the Spin and Statistics of Elementary Particles . J. S. DE WET 646
Photoelectric and Optical Properties of Sodium and Barium . . . . . ROBERT J. MAURER 653

Letters to the Editor:

Search for a Neutron-Deuteron Reaction . . . . . L. B. BORST AND WILLIAM D. HARKINS 659
Photophoresis of Small Particles in a Magnetic Field . . . . . FELIX EHRENHAFT 659
System of Units for Nuclear and Cosmic-Ray Phenomena . . . . . BRUNO ROSSI 660
Isomeric Silver and the Weizsäcker Theory . . . . . LUIS W. ALVAREZ, A. C. HELMHOLZ AND ELDRED NELSON 660
Elementary Derivation of Thermal Diffusion . . . . . S. PHILLIPS FRANKEL 661
New Afterglow Phenomenon . . . . . JOSEPH KAPLAN 662
Double Ionization by the Auger Effect: The Cause of a Satellite Intensity Anomaly for the X-Ray Diagram Line $M\alpha_1$ . . . . . F. R. HIRSH, JR. 662
Cosmic-Ray Intensities and Air Masses . Y. NISHINA, Y. SEKIDO, H. SIMAMURA AND H. ARAKAWA 663
Energy Loss of Electrons in Carbon and the Decay of the Mesotron . . . . . H. R. CRANE, N. L. OLESON AND K. T. CHAO 664
Radioactive Zirconium and Columbium from Uranium Fission . . A. V. GROSSE AND E. T. BOOTH 664
Compton Line Profiles Applied to Chemical Binding . . . . . BRUCE L. HICKS 665

APRIL 15, 1940

Relative Probability for the Loss of Neutrons and Alpha-Particles from an Excited Nucleus . . . . . J. M. CORK AND J. HALPERN 667
Anomalous Scattering of Fast Neutrons . . . . . M. R. MACPHAIL 669
Electrical Quadrupole Moment of the Deuteron. The Radiofrequency Spectra of HD and D_2 Molecules in a Magnetic Field . . . . . J. M. B. KELLOGG, I. I. RABI, N. F. RAMSEY, JR. AND J. R. ZACHARIAS 677
Secondary Emission from Films of Silver on Platinum . . . . . A. E. HASTINGS 695
Luminescence of Pure Radium and Barium Compounds . . . . . D. H. KABAKJIAN 700
Band Spectrum of Antimony Chloride . . . . . W. F. C. FERGUSON AND ISIDORE HUDES 705
Spectra of Lead Hydride and Tin Hydride in the Near Infra-Red . . . . . WILLIAM W. WATSON AND RALPH SIMON 708
Index of Refraction of Methane in the Infra-Red and the Dipole Moment of the CH Bond . . . . . R. ROLLEFSON AND R. HAVENS 710
Diffraction of Radio Ranges by Hills . . . . . WILLIAM R. HASELTINE 717
Theory of Spark Discharge . . . . . J. M. MEEK 722
Ferromagnetic Anisotropy, Magnetization at Saturation, and Superstructure in Ni_3Fe and Nearby Compositions . . . . . EUGENE M. GRABBE 728
Probable Error for Poisson Distributions . . . . . ERIC RODGERS 735
Osmotic Diffusion in Gases . . . . . E. J. HELLUND 737
Isotope Separation by Transient Pressure Diffusion . . . . . E. J. HELLUND 743
Note on Grüneisen's Constant for the Incompressible Metals . . . . . J. C. SLATER 744

Letters to the Editor:

Cross Section of the Reaction $N^{15}(p, \alpha)C^{12}$ . . . . . M. G. HOLLOWAY AND H. A. BETHE 747
Further Experiments on Fission of Separated Uranium Isotopes . . . . . A. O. NIER, E. T. BOOTH, J. R. DUNNING AND A. V. GROSSE 748
Shower Production by Mesotrons in Different Materials . . W. F. G. SWANN AND W. E. RAMSEY 749
Fission of the Separated Isotopes of Uranium . . . . . K. H. KINGDON, H. C. POLLOCK, E. T. BOOTH AND J. R. DUNNING 749
Collisions of Alpha-Particles with Chlorine Nuclei . . . . . WILBUR HANSEN AND GERALD A. WRENSHALL 750
New Radioactive Isotope of Masurium, $_{43}Ma^{101}$ . . . . . R. SAGANE, S. KOJIMA, G. MIYAMOTO AND M. IKAWA 750
On the Dynamics of Complex Fission . . . . . R. D. PRESENT AND J. K. KNIPP 751
Radio Isotopes of Chromium . . . . . TOSHIO AMAKI, TAKEO IIMORI AND ASAO SUGIMOTO 751
Spectroscopic Evidence for the B_2 Molecule . . . . . A. E. DOUGLAS AND G. HERZBERG 752

MAY 1, 1940

Electric Quadrupole Moments of Ga^{69} and Ga^{71}. An Atomic Beam Study of the Hyperfine Structures of the $^2P_{1/2}$ and $^2P_{3/2}$ States of Ga^{69} and Ga^{71} . . . . . NICHOLAS AUGUSTUS RENZETTI 753

Radiofrequency Spectra of Atoms. Hyperfine Structure and Zeeman Effect in the Ground State of Li^6, Li^7, K^{39} and K^{41} . . . . . P. KUSCH, S. MILLMAN AND I. I. RABI 765

On the Seasonal and the Atmospheric Temperature Effect in Cosmic Radiation . . . . . VICTOR FRANCIS HESS 781

$L\alpha$ Satellite Lines for Elements Mo(42) to Ba(56) . . . . . CHARLES A. RANDALL AND LYMAN G. PARRATT 786

Binding Energy of Li^7 . . . . . K. G. CARROLL 791

Preliminary Experimental Study of New Diffraction Maxima in X-Ray Photographs . . . . . STANLEY SIEGEL AND W. H. ZACHARIASEN 795

Equations of Motion in Electrodynamics . . . . . L. INFELD AND P. R. WALLACE 797

Solutions of Equations for Particles of Spin Zero or One When No Field Is Present . . . . . A. H. TAUB 807

Cross Section for Change of Charge and Ionization by High Velocity Metallic Ions in Hydrogen and Helium . . . . . CHALMERS W. SHERWIN 814

Influence of Discharge Chamber Structure Upon the Initiating Mechanism of the High Frequency Discharge . . . . . SHERWOOD GITHENS, JR. 822

Properties of Rochelle Salt . . . . . HANS MUELLER 829

On the Spark Spectrum of Silver . . . . . EBBE RASMUSSEN 840

Letters to the Editor:

Theory of the Magnetite Light Shutter . . . . . W. C. ELMORE 842

Influence of Electrostatic Fields on the Elastic Properties of Rochelle Salt . . . . HANS MUELLER 842

Theory of Multiple Scattering of Electrons . . . . . JAMES H. BARTLETT, JR. 843

Isotopic Identification of Induced Radioactivity by Bombardment of Separated Isotopes; 37-Minute Cl^{38} . . . . . J. W. KENNEDY AND C. T. SEABORG 843

Scattering of Light by Liquid Helium . . . . . L. I. SCHIFF 844

Attainment of High Hydrostatic Pressures . . . . . ROY W. GORANSON AND E. A. JOHNSON 845

Proceedings of the American Physical Society:

Metropolitan Section: Columbia University Meeting, April 5, 1940 846

MAY 15, 1940

Intensity and Rate of Production of Mesotrons in the Stratosphere . . . . . MARCEL SCHEIN, WILLIAM P. JESSE AND E. O. WOLLAN 847

Energy Release from $Be^9(d,\alpha)Li^7$ and the Production of Li^{7*} . . . ELIZABETH RIDDLE GRAVES 855

Internal Scattering of Gamma-Rays . . . . . E. P. COOPER AND P. MORRISON 862

Oppenheimer-Phillips Process . . . . . G. M. VOLKOFF 866

K-Absorption Edges of Br (35) and Kr (36) . . . . . C. H. SHAW 877

Fine Structure of the X-Ray Absorption Limits of Bromine and Chlorine . . . . . T. M. SNYDER AND C. H. SHAW 881

Origin of Radio Fade-Outs and the Absorption Coefficient of Gases for Light of Wave-Length 1215.7A . . . . . WILLIAM M. PRESTON 887

Arc Spectrum of Silver . . . . . A. G. SHENSTONE 894

Thermal Separation of Isotopes . . . . . WILLIAM W. WATSON 899

Field Theories for Charged Particles of Arbitrary Spin . . . . . L. I. SCHIFF 903

On the Time Distribution of So-Called Random Events . . . . . WILLY FELLER 906

On the Deviations from Ohm's Law at High Current Densities . . . . . EUGENE GUTH AND JOSEF MAYERHÖFER 908

Galvano- and Thermomagnetic Phenomena in Iron and Nickel . . . . . E. H. BUTLER, JR. AND E. M. PUGH 916

Fresnel Formulae Applied to the Phenomena of Nonreflecting Films . . . . . KATHARINE B. BLODGETT 921

New Method for Investigating the Refractive Index and the Thickness of Thin Interference Films on Glass . . . . . ANTONIN VAŠIČEK 925

Direct Comparison on a Crystal of Calcite of the X-Ray and Optical Interferometer Methods of Determining Linear Thermal Expansion. Evidence of Differences Among Calcite Crystals . . . . . J. B. AUSTIN, H. SAÏNI, J. WEIGLE AND R. H. H. PIERCE, JR. 931

Letters to the Editor:

Note on the Ends of the Mesotron Tracks Observed in an Expansion Chamber . . . . . A. Migdal and J. Pomeranchuk 934
Experiments on the Periodic Deviation from the "Schottky Line" . . . . Wayne B. Nottingham 935
Erratum: On the Yield of Nuclear Reactions with Heavy Elements . . . . . V. F. Weisskopf and D. H. Ewing 935
Notes on the Separation of Alloys and Isotopes by the Centrifuge . . . . . H. C. Pollock 935
Observations on the Dark Current of a Willemite Crystal . . R. C. Herman and R. Hofstadter 936
Resonance Scattering of Neutrons in Helium . . . . . H. Staub and H. Tatel 936
Evidence for a New Type of Nuclear Reaction . . . . . R. Sherr 937
Production and Half-Life of Chlorine 33 . . . . . J. Barton Hoag 937
Magnetic Storm Effect on Cosmic Rays at High Latitudes . . . . . Donald H. Loughridge and Paul Frederick Gast 938
Effect of the Coulomb Force on Binding Energies of Light Nuclei . . . . . W. E. Stephens 938

Proceedings of the American Physical Society:

Southeastern Section: Charleston, South Carolina, Meeting, March 22–23, 1940: Minutes and Abstracts 1–24 939
New York State Section: Buffalo, New York, Meeting, April 6, 1940 944

June 1, 1940

Anomalous Absorption of the Hard Component of Cosmic Rays in Air . . . . . M. Ageno, G. Bernardini, N. B. Cacciapuoti, B. Ferretti and G. C. Wick 945
Missing Heavy Nuclei . . . . . Louis A. Turner 950
On the Resonance Scattering of Alpha-Particles . . . . . M. E. Rose 958
Products of the Uranium Fission. Radioactive Isotopes of Iodine and Xenon . . . . . Richard W. Dodson and Robert Dudley Fowler 966
Anomalous Scattering of Neutrons by Helium and the *d–d* Neutron Spectrum . . . . . Emmett Hudspeth and Henry Dunlap 971
Interference Phenomena in the Scattering of Slow Neutrons . . . . . Harold G. Beyer and Martin D. Whitaker 976
Radioactive Isotopes of Indium . . . . . J. L. Lawson and J. M. Cork 982
Structure of the *L* Absorption of Sodium Metal and Its Halides . . . . . H. M. O'Bryan 995
On the Theory of Meson Decay . . . . . H. A. Bethe and L. W. Nordheim 998
Hindered Rotation in Methyl Alcohol . . . . James S. Koehler and David M. Dennison 1006
Measurements of Discharge Characteristics of Geiger-Mueller Counters . . W. E. Ramsey 1022
Discharge Mechanism of Geiger-Mueller Counters . . . . . C. G. Montgomery and D. D. Montgomery 1030
Composition of Mixed Vapors in the Cloud Chamber . . . T. N. Gautier and A. E. Ruark 1040
Vapor Pressure of Liquid Bismuth Between 603 and 638°C . . . . . Alfred H. Weber and S. C. Kirsch, S.J. 1042

Letters to the Editor:

Neutron-Proton Interaction . . . . . Henry B. Hanstein 1045
Sodium Chloride at Very High Pressures . . . . . Robert B. Jacobs 1046
Direct Evidence of a Proton Component of the Cosmic Radiation . . . . . Thomas H. Johnson, J. Griffiths Barry and Ralph P. Shutt 1047
Photographic Reversal with X-Rays . . . . . O. J. Baltzer and J. E. Nafe 1048
Cause and Removal of Photographic Reversal . . . . . J. E. Nafe and G. E. M. Jauncey 1048
Pressure Effect on Infra-Red Absorption . . . . . John Strong and Kenichi Watanabe 1049
Diffusion, Brownian Movement, Loschmidt-Avogadro's Number and Light . . . Felix Ehrenhaft 1050
Air Mass Effect on Cosmic-Ray Intensity . Y. Nishina, Y. Sekido, H. Simamura and H. Arakawa 1050
Further Evidence for the Existence of Mesotron Showers . . W. F. G. Swann and W. E. Ramsey 1051
Errata: Paramagnetic Relaxation Times for Titanium and Chrome Alum . . . . J. H. Van Vleck 1052

Proceedings of the American Physical Society:

Ohio Section: Minutes of the Gambier, Ohio, Meeting, April 6, 1940 1053
Washington, D. C., Meeting, April 25–27, 1940: Minutes and Abstracts 1–179; Author Index . . . 1054

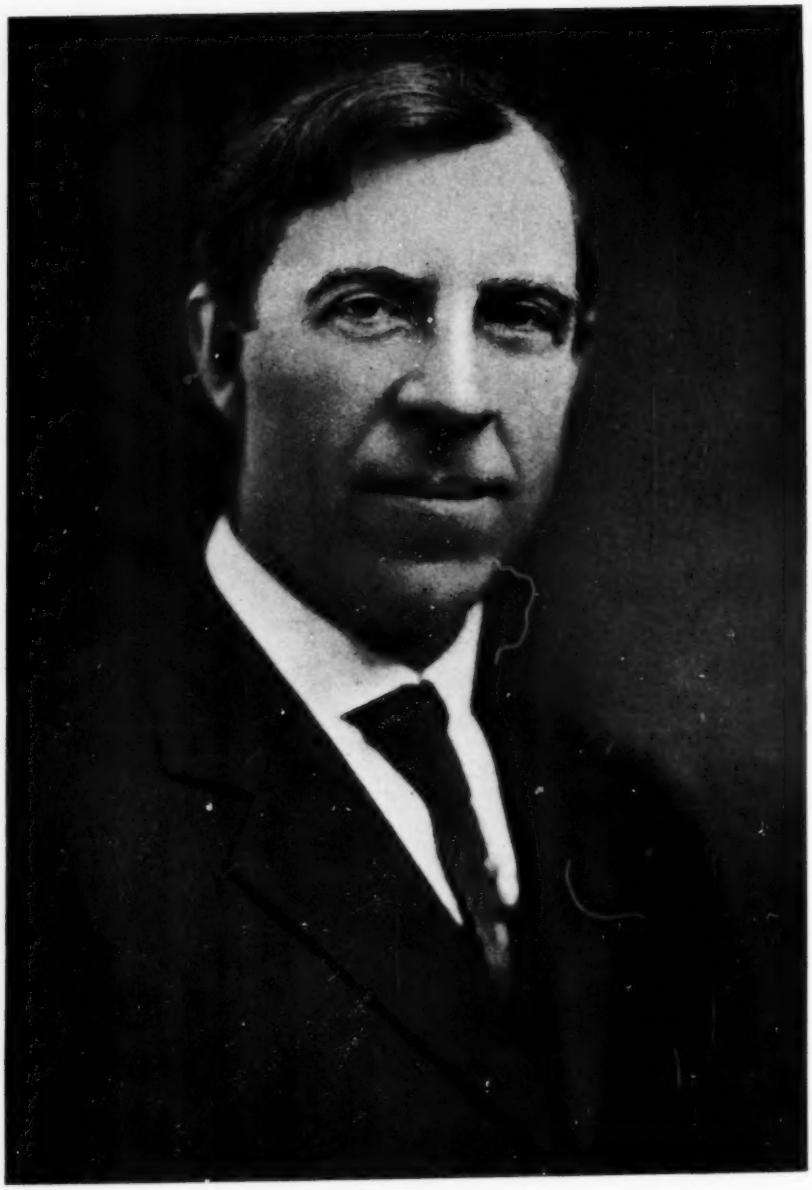
JUNE 15, 1940

Collisions of Alpha-Particles with Carbon Nuclei . . . . . GERALD A. WRENSHALL 1095
Heavy Electron Pair Theory of Nuclear Forces . . . . . R. E. MARSHAK 1101
Study of the Nuclear Radiations from Antimony and Arsenic . . . . . ALLAN C. G. MITCHELL, LAWRENCE M. LANGER AND PAUL W. MCDANIEL 1107
Protons from the Transmutation of Boron by Deuterons . . . . . ERNEST POLLARD, W. L. DAVIDSON, JR. AND H. L. SCHULTZ 1117
Radiations from Radioactive Indium (116) . . B. R. CURTIS AND J. REGINALD RICHARDSON 1121
Continuum Theory of the Compound Nucleus . . . . . H. A. BETHE 1125
Optical Activity, Circular Dichroism, and Absorption of Crystalline Nickel Sulphate . . . . . L. R. INGERSOLL, P. RUDNICK, F. G. SLACK AND N. UNDERWOOD 1145
On a Proposed Thermoelectric Origin of the Earth's Magnetism . . . . . D. R. INGLIS AND E. TELLER 1154
Discussion on the Isotopic Weight of C^{12} . . . . . JOSEF MATTAUCH 1155
On the Establishment of Grand Canonical Distributions . . . . . RICHARD C. TOLMAN 1160
New Method for Calculating Wave Functions in Crystals . . . . . CONYERS HERRING 1169
Optical and Magnetic Properties of Magnetite Suspensions. Surface Magnetization in Ferromagnetic Crystals . . . . . L. W. MCKEEHAN 1177

Letters to the Editor:

Artificial Radioactivity Induced in Zr and Mo . . . . . R. SAGANE, S. KOJIMA, G. MIYAMOTO AND M. IKAWA 1179
On the Equilibrium of the Components of Cosmic Radiation at Sea Level . . . . . GIUSEPPE COCCONI AND VANNA TONGIORGI 1180
Force on the Cathode of an Arc . . . . . R. RISCH 1181
Induced β-Activity of Uranium by Fast Neutrons . . . . . Y. NISHINA, T. YASAKI, H. EZOE, K. KIMURA AND M. IKAWA 1182
Absorption Law for Total Radiation Measurements . . . . . W. P. BERGGREN 1183
Eigenvalue Problem of the Dirac Electron . . . . . ALFRED LANDÉ 1183
Spin Angular Momenta of Elementary Particles . . . . . E. L. HILL 1184
Anomalous Dispersion and Absorption of Electric Waves in Solutions of Amino-Acids and Dipeptides . . . . . J. B. BATEMAN AND G. POTAPENKO 1185
Radioactive Element 93 . . . . . EDWIN MCMILLAN AND PHILIP HAUGE ABELSON 1185
Masses of Stable Nuclei from Ne^{20} to Fe^{57} . . . . . ERNEST POLLARD 1186
Anomalous Scattering of Neutrons by Helium . . . . . T. W. BONNER AND EMMETT HUDSPETH 1187
Dispersion of Supersonic Waves in Cylindrical Rods . . . . . G. S. FIELD 1188
On the Dynamics of Complex Fission . . . . . R. D. PRESENT AND J. K. KNIPP 1188
Neutron-Induced Radioactivity of Tungsten . . . . . O. MINAKAWA 1189

Author Index to Volume 57 1190
Analytic Subject Index to Volume 56 1206
Volume Table of Contents iii



Floyd K. Richtmyer

1881–1939